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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/653,023	09/01/2000	John Oliensis	13701	5540

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EXAMINER

KIBLER, VIRGINIA M

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 05/20/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

9

Office Action Summary

Application No.

09/653,023

Applicant(s)

OLIENSIS, JOHN

Examiner

Virginia M Kibler

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☒ Claim(s) 1 and 4 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 September 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: "09/652,820" should be inserted after "Serial No." on page 1, line 8; "8/31/00" should be inserted after "filed on" on page 1, line 10; the translational flow vectors on the top of page 11 should be deleted (already shown on page 10); and ",then" should be changed to ", then" on page 22, line 9.

Appropriate correction is required.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending Application No.

09/652,820 in view of Aguiar et al. (*Factorization as a Rank 1 Problem*).

Regarding claim 1 of the instant application, claim 1 of 09/652,820 covers equivalent subject matter except for the limitations regarding rank-3 factorization. Using rank-3 factorization rather than rank-1 factor matrices is known in the art as evidenced by Aguiar et al.

Art Unit: 2623

(Abstract, lines 1-12). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the rank-3 factor matrices of claim 1 of 09/652,820 in view of Aguiar et al. as a design choice.

This is a provisional obviousness-type double patenting rejection.

Claim Objections

4. Claim 1 is objected to because of the following informalities: "tothe" should be changed to "to the" on page 31, line 15. Appropriate correction is required.
5. Claim 4 is objected to because of the following informalities: "]": should be inserted before "where" on page 32, line 26. Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1-13 are rejected under 35 U.S.C. 102(a) as being anticipated by Oliensis et al. (*Structure from Motion using Points, Lines, and Intensities*).

Regarding claim 1, Oliensis et al. ("Oliensis") discloses a method for recovering 3D scene structure and camera motion from image data obtained from a multi-image sequence (Sect.1, para. 1). Oliensis discloses determining image data shifts for each successive image

with respect to the reference image, the shifts being derived from the camera translation and/or rotation from the reference perspective to the successive different perspectives (Sect. 3.1).

Oliensis further discloses constructing a shift data matrix that incorporates the image data shifts for each image and calculating two rank-3 factor matrices from the shift data matrix using SVD one rank-3 factor matrix corresponding to the 3D structure and the other corresponding to the camera motion (Sect. 1, para. 7), recovering the 3D structure from the 3D structure matrix by solving a linear equation and recovering the camera motion from the camera motion matrix using the recovered 3D structure (Sect. 3.5).

Regarding claim 2, Oliensis discloses the image data is one or more selected from group consisting of points, lines, and intensities (Abstract).

Regarding claim 3, Oliensis discloses initially recovering and compensating for camera rotation (Sect. 3.1).

Regarding claim 4, Oliensis discloses computing H and D_{CH} where H is a $(N_{tot} - 3) \times N_{tot}$ matrix and $D_{CH} = C^{-1/2} D H^T$ and $N_{tot} = 2N_p + 2N_L + N_x$ where N_p , N_L and N_x equal the number of points, lines and intensities and C is a $(N_l - 1) \times (N_l - 1)$ matrix with C_{ij} as defined in lines 9-10 of claim 4 (Sect. 3.5, para. 1 and 2). Oliensis further discloses D and H as defined in lines 11-12 of claim 4 (Sect. 3.5, para. 1 and 2) and further discloses ψ_{Lx} , ψ_{Ly} , ψ_{Lz} as defined in lines 14-16 of claim 4 (Sect. 3.3) and ψ_x , ψ_y , ψ_z as defined in lines 17-18 of claim 4 (Sect. 3.2). Oliensis discloses the three point rotation flows as defined in lines 20-21 of claim 4 (Sect. 2, para. 3) and the rotational flows as defined in lines 22-23 of claim 4 (Sect. 3.4). Oliensis discloses Λ as an $N_i \times 2N_L$ matrix where each row corresponds to a different image i and as defined on page 32, lines 26-27 and page 33, line 1 (Sect. 3.3, para. 6-8). Oliensis further discloses S as a $N_i \times 2N_p$ matrix where each row corresponds to a different image I and equals $[\{s_x^i\}^T \{s_y^i\}^T]$ (Sect. 3.2) where $s_m^i = q_m^i - q_m^0$ and denotes the image displacement for the m -th tracked point

(Sect. 2, para. 3) and where Δ is a $N_I \times N_x$ matrix where each row corresponds to an image I and equals $\{\Delta I^i\}^T$ (Sect. 3.4) where ΔI is the change in image intensity with respect to the reference image and where I^i denotes the i -th intensity image and where $I_n^i = I^i(p_n)$ denotes the image intensity at the n -th pixel position in I^i (Sect. 2, para. 5) and where the notation $\{V\}$ is used to denote a vector with elements given by the V^a (Sect. 2, para. 6).

Regarding claim 5, Oliensis discloses computing the best rank-3 factorization of $D_{CH} = M^{(3)}S^{(3)T}$ where $M^{(3)}$ and $S^{(3)}$ are rank 3 matrices corresponding to motion and structure using SVD (Sect. 3.5, Step 1).

Regarding claim 6, Oliensis discloses eliminating structure unknowns Q_z , B_z , and Z^{-1} from the Φ_a to get $3N_{tot}$ linear constraints on the U and Ω using the linear equation (Sect. 3.5, Step 2) where U and Ω are unknown 3×3 matrices and Φ and Ψ represent total translational and rotational flow vectors (Sect. 3.5, para. 1 and 2). Oliensis discloses solving these constraints with $O(N_{tot})$ computations using the SVD (Sect. 3.5, Step 2) where the total translational flow vectors are as defined in line 20 (Sect. 3.5) and $\Phi_{Lx} \Phi_{Ly} \Phi_{Lz}$ as defined in lines 21-27 of claim 6 (Sect. 3.3) and where $\Phi_x \Phi_y \Phi_z$ are as defined on page 34, line 1 of claim 6 (Sect. 3.2) and where $\Phi_{lx} \Phi_{ly} \Phi_{lz}$ are as defined on page 34, lines 4-9 (Sect. 3.4). Oliensis further discloses recovering the structure unknowns Q_z , B_z , and Z^{-1} (Sect. 3.5, Step 3).

Regarding claim 7, Oliensis discloses using $S^{(3)}U$ (Sect. 3.5, Step 4) and D_{CH} (Sect. 3.5, Eq. 9) to recover the translations, and recovering rotations (Sect. 3.5, Step 5) wherein C is defined by lines 17-18 of claim 7 (Sect. 3.5, Para. 2).

Regarding claim 8, the arguments analogous to those presented above for claims 1 and 3 are applicable to claim 8.

Art Unit: 2623

Regarding claim 9, the arguments analogous to those presented above for claim 2 are applicable to claim 9.

Regarding claim 10, the arguments analogous to those presented above for claim 4 are applicable to claim 10.

Regarding claim 11, the arguments analogous to those presented above for claim 5 are applicable to claim 11.

Regarding claim 12, the arguments analogous to those presented above for claim 6 are applicable to claim 12.

Regarding claim 13, the arguments analogous to those presented above for claim 7 are applicable to claim 13.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Diamantaras et al., "Camera Motion Parameter Recovery Under Perspective Projection"
and

Kung et al., "An SVD Approach to Multi-Camera-Multi-Target 3D Motion-Shape
Analysis."

Art Unit: 2623


Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Virginia M Kibler whose telephone number is (703) 306-4072. The examiner can normally be reached on Mon. - Thurs. 8:00 - 5:30 and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

VK
May 16, 2003


AMELIA M. AU
SUPERVISORY PATENT EXAMINER
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